

From the house of Amar Chitra Katha and Tinkle

# BRAINWAVE™

SCIENCE IS JUST A GAME

Vol. 02 Issue 04  
April 2013  
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score  
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science while  
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# MEET THE SMARTIES



**Dr. Dodo:** Dr. Dodo is the co-founder of BW Labs and is the last living dodo. He holds a PhD in anachronomaly and parallel universes from the University of Clockwindistan. He invented the Galileo series of time machines.



**Skree!:** Skree! is the other founder of BW Labs. She loves dangerous experiments. She makes mini black holes before breakfast and has dark matter for lunch.



**Arby:** Arby is a genius who will grow up to be Aryabhata. He came to the future, thanks to Dr. Dodo's time machine. He is a fan of numbers, banana fritters and robot wars.



**Mr X:** Mr. X, short for Xavier, was once Dr. Dodo's student. X is as brilliant as Alby and Arby, and by virtue of his knowledge of science, as powerful as Bhoo when the situation demands.



**Bhoomi:** Bhoomi, a.k.a. Bhoo, is an enigma. No one knows where she is from and how she came into being. She is made up of earth, wind, fire, and water in equal parts. Her alter-ego is Gaia Goel, a world famous science sleuth.

**Alby:** Alby will grow up to be Albert Einstein. However, now, like Arby, he too has been sucked into the future. When he is not researching, he plays the violin.



# Satiate Your Curiosity!

Dear Readers,

Summer vacation is here! After the year's hard work, you deserve an ample dose of fun. This issue and the next do just that.

Humans have achieved a lot since they came into being, but there are a number of things that still puzzle us. Questions such as 'How big is the universe?', 'Does the Loch Ness Monster exist?', 'Is there extraterrestrial life?', 'Is there something beyond infinity?' and 'How long do trees live?' are yet to be answered.

In these two issues, we discuss some of these fascinating unsolved science mysteries. Happy reading!

Scientifically,  
JD, [jayadev.calamur@ack-media.com](mailto:jayadev.calamur@ack-media.com)

# BRAINWAVE™

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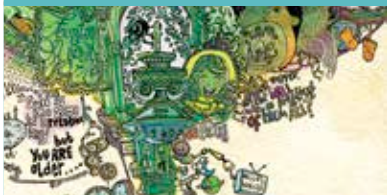
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# Magic Liquid

*Can a ball be made out of a liquid? Can you drop raw eggs on the floor without breaking them?*

by Kayomarz Bacha

To do  
this,  
you need:

- 1 kilo of corn flour (available at any supermarket)
- 500 ml water
- 2 large bowls
- An empty container
- 2 lemons or similar sized spherical objects
- 2 raw eggs
- 2 zip-lock pouches
- A hammer
- A few, small iron nails
- 2 pieces of wood (small enough to fit in the bowls)
- A book to note down your observations

**Note:**

This experiment can get a little messy. Do it outdoors lest your parents get angry!



## METHOD:



Do as instructed in each of the below steps. After each step, note down your observations in detail.

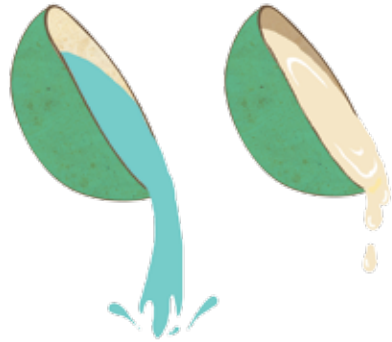
### Step 1

Mix corn flour and water in a 2:1 ratio in one bowl. Fill the other bowl with water.



### Step 2

Pour out the water from the second bowl into the empty container. Try doing the same with the corn flour - water mixture.



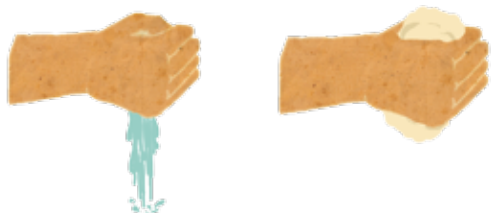
### Step 3

Refill the now empty bowl with water. Punch the surface of water. Do the same with the corn flour - water mixture.



### Step 4

Cup your hands and take some water out of the water bowl. Try the same with the corn flour - water mixture.



### Step 5

Make a small ball out of the corn flour - water mixture. Keep moving it from one hand to the other continuously. After some time, try to keep it still in your palm.



### Step 6

Dunk the lemon into the second bowl of water. Do the same with the corn flour - water mixture.



### Step 7

Allow the lemons to sink to the bottom of the bowls and try taking each one out.



### Step 8

Take the two small pieces of wood. Place one in each bowl. Try hammering a nail into each of them.





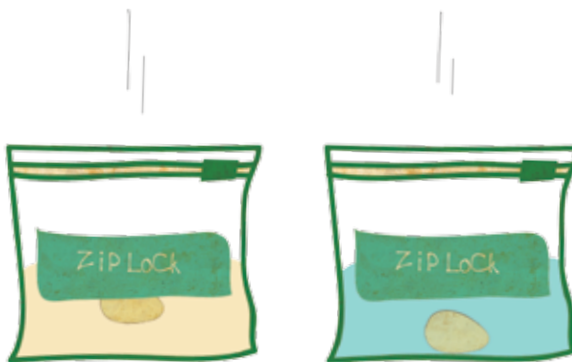
### Step 9

Take the two zip-lock bags. Fill half of one bag with water and the other with the corn flour - water mixture. Take two eggs and place one in each zip lock bag. Lock the bags, making them airtight.



### Step 10

Drop the two bags from the same height.



### Why does this happen?

A mixture of water and corn flour forms something called a non-Newtonian fluid.

Non-Newtonian fluids are liquids that exhibit the properties of solids when pressure is applied.

When you play with the corn flour - water

mixture by punching its surface or making a ball out of it, you apply pressure, making it exhibit the properties of a solid.

The moment pressure is released, the mixture retains its liquid properties.

Other examples of non-Newtonian fluids include honey, ketchup and toothpaste.

### Why Corn Flour?

When corn flour and water mix, the corn starch grains are like tiny rocks bobbing in water. They are so densely packed that they touch each other. When pressure is applied, the molecules come closer to each other and resemble a solid. When pressure is released, the molecules slowly separate and exhibit liquid-like properties. ■

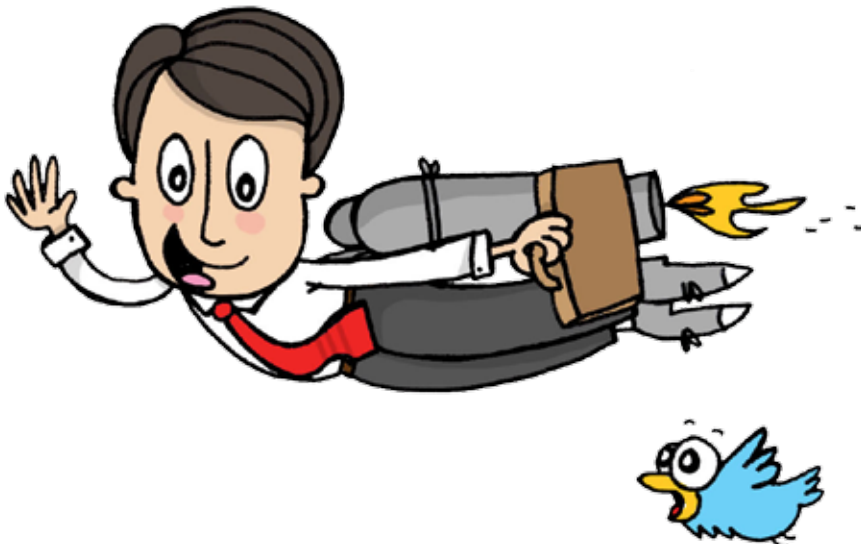
Try this at home, note down your observations, shoot photographs or videos and email them to us at [kayomarz.bacha@ack-media.com](mailto:kayomarz.bacha@ack-media.com). The most original and comprehensive response will win the upcoming BW Do-It-Yourself e-book worth Rs. 200!



Over the years, the cockroach has managed to evolve into more than 4500 species! Cockroaches are said to be the only living beings that can survive even a nuclear holocaust!



Neural Signals Inc. has developed a device called the 'Brain Communicator'. This brain implant helps physically paralyzed patients control their computers through their thoughts.



During World War II, Germany experimented with an early version of the jet pack, called the 'Himmrlstormer' or 'Skystormer'. No one knows what became of the device they had tested.



# Mirror, Mirror On The Wall!



by Srinath Perur

**Chayanikya Biswas asks:** How are thousands of images formed when two mirrors are positioned opposite to each other? Why don't the images fade away like rainbows do? Are there mirrors through which light can pass? When my sister and I shine a torch on a mirror, we can see the image of light on the wall behind!

If you hold a pencil in front of your bathroom mirror, you will see its reflected *virtual* image *behind* the mirror. Light rays scattered from the pencil bounce off the mirror and into your eyes. These rays appear to converge at a point behind the mirror and our brain makes sense of this as if there is a pencil behind the mirror. You cannot place a screen there and capture a real image. This is called a virtual image.

When you hold another mirror behind the pencil, light rays bounce back and forth between those two mirrors, forming multiple images. But what you see in the end is a single virtual image. It is inside this image that you see the pencil's reflection, the reflection of the reflection, the reflection of the reflection and so on. This is the phenomenon that you see in barbershops, beauty parlours and dressing rooms.

These reflections get smaller and fainter as you look deeper into the mirror. I tried it and I had



trouble counting more than twelve reflections! You too try it. The image grows dull because there is no mirror that reflects all the light that falls on it. In practice, a mirror absorbs some light or – as with the mirror you mentioned – allow some light to pass through itself.

Some mirrors are indeed made to reflect only about half the light that falls on them. They are useful in experiments in which a beam of light needs to be split into two. They are also used as 'one-way glass' since they act as mirrors on the side with more light. This is why the mirrored glass of a vehicle or your home appears see-through sometimes. ■

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Have a burning question? Email us at [brainwave@ack-media.com](mailto:brainwave@ack-media.com) with 'Ask Us Why' as the subject. The best question will win the latest Amar Chitra Katha animation CD!

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## THE MUMMY DIARIES

Written By : Jayadev Calamur Artwork: Parvati Pillai



Tutankhamun was the king of Egypt between 1332 BC and 1323 BC. He was nine years old when he became king. Sadly, he died when he was 19.

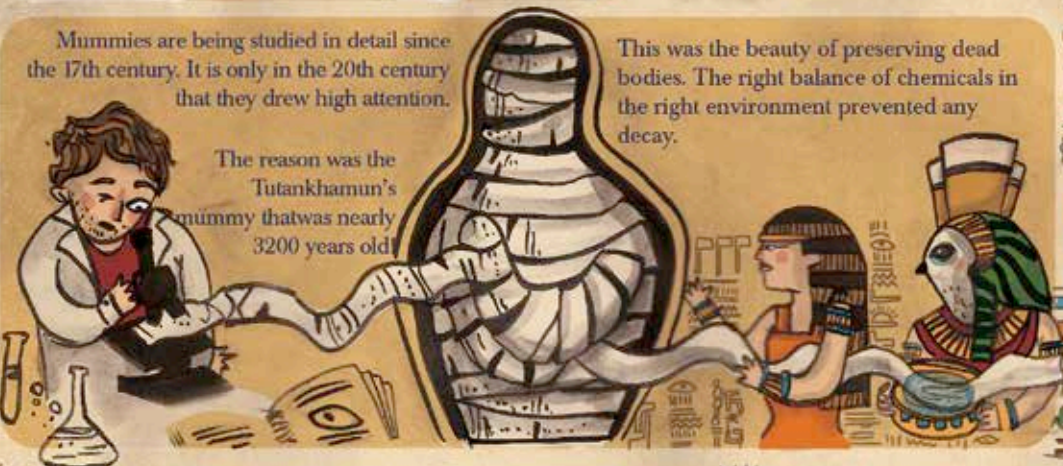
Before we read further, let us understand that a Mummy is a dead body that is preserved from extreme temperature and humidity, using chemicals. The body is wrapped in bandages and does not decay.

Apparently, the medieval doctors of Alexandria, Egypt prescribed powdered mummy as a wonder drug! Mummies were dug up and made into medicine until the 18th century.



Mummies are being studied in detail since the 17th century. It is only in the 20th century that they drew high attention.

This was the beauty of preserving dead bodies. The right balance of chemicals in the right environment prevented any decay.





There are hundreds of mummies in the pyramids of Egypt. Tutankhamen's was the most important because it was found in the largest of Pyramids, the Great Pyramid.

Apparently it was not a wise decision to open his tomb. Along with it came what is to be known as *the Curse of the Pharaoh!*



The discoverer of King Tutankhamen's tomb was a man named Howard Carter, in 1923.

It was a monumental achievement, but the curse took its course.

Curse

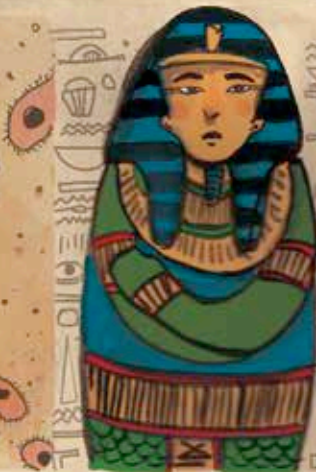
The financial backer of the expedition, Lord Carnarvon suffered a severe mosquito bite which was later infected with a razor cut, and died. The media went crazy and attributed it to the curse of the Tutankhamun. Sir Arthur Conan Doyle, the creator of Sherlock Holmes even suggested that Lord Carnarvon's death was caused by "elementals" created by Tutankhamen's priests to guard the royal tomb!



A possible explanation is that a deadly fungus was grown in the enclosed tomb and was released when the tomb was opened, resulting in Lord Carnarvon's death.



Researchers have pointed out that many others who visited the tomb or helped to discover it led long and healthy lives. A study showed that out of the 58 people who were present when the tomb was opened, only eight died within a few years. All the others, including Howard Carter, lived!



Despite the scientific insights gained by researchers, the Curse of the Pharaoh remains a good story to tell!





## Oldest Star Discovered?

Scientists claim to have discovered the oldest star in the universe. According to research, the star named HD 140283 is estimated to be 13.2 billion years old!

This star is located fairly close to our solar system, around 190 light years away. Scientists believe that this star is the oldest because the amount of light it emits indicates a nearly depleted hydrogen core in addition to small amounts of some heavier elements. Tracing the amount of these elements is an important clue as to when the star formed in relation to the Big Bang Theory.

The Big Bang occurred an estimated 13.7 billion years ago. This means that the HD 140283 had formed about 500 million years after the birth of the universe.

## A Neanderthal Baby?

If you thought things were strange enough, here is the strangest claim yet. George Church, 58, a professor at Harvard University claims that he can clone a Neanderthal baby. He says he needs a woman 'brave enough' to carry the offspring.

He opines that we would soon be able to clone Neanderthals by using the advanced technology of cloning that is rapidly developing further.

Neanderthals have been extinct for at least 33,000 years. But human cloning is illegal in several countries. So, Prof. Church will have to present his case before various committees before his research is deemed ethical.

## Giant Squid Caught on Camera

A video that captures a giant squid swimming in the ocean depths has taken the world by storm. Marine conservationists feel that this is a major breakthrough.

"People have been searching for them for hundreds of years, literally," said Richard Ellis, the author of *The Search for the Giant Squid: The Biology and Mythology of the World's Most Elusive Sea Creature*.

Images of the sea creature were released in January 2013. The creature is 10 feet long and was found in the Pacific Ocean, far off the Japanese mainland. It has eight arms and two tentacles.

A team of researchers from the National Science Museum in Japan, the Discovery Channel and the Japanese broadcaster NHK

worked together on this mission. The squid was tracked after 55 dives in two special submersible vehicles that spent a total of more than 285 hours beneath the waves. Some of the dives went deeper than 3,000 feet!



Image source: CNN International





Artwork: Sathish Sinha



# MYSTERIES A PLenty 1

by Jayadev Calamur

*Join an alien, a dragon and the Abominable Snowman on an exciting adventure through space, the highest mountains and the deep interiors of Earth.*

It was a regular day for Trillian. She sat in front of her supercomputer in her super-spaceship and was examining what was going on in the universe. This was her job. She had studied at the United Planets University for Intergalactic Relations and had the title “Supreme Peacekeeper” conferred upon her. It was her crowning glory.

Trillian loved her job. It was so much fun watching different galaxies from a single source. There was travel involved as well. Once a week – which for us is a year – Trillian would board her spacecraft and explore the universe.

Trillian was a regular visitor to the Milky Way. She particularly loved visiting the Earth, a planet that amused

her. She admired earthlings for being tenacious with the primitive technology they possessed, but found it amusing that they study the number of stars in the sky, while they still do not know more than a fraction of the species living on their planet.

From her computer, Trillian looked at the Earth. The

maps on her computer showed three-dimensional images of everything. She zoomed in to see a volcano erupt. Volcano eruptions, from that height, looked magnificent to her.

Something in the midst of the eruption caught her eye. It was a large, purple thing snorting fire. It was a dragon. In fact, it was Draco, an old







friend of hers.

“It has been a while (this could amount to a few millennia in terms of Earth Years) since I spoke to Draco,” thought Trillian. “I should meet him and Snowy, the Abominable Snowman. I think that there is nothing abominable about Snowy. In fact, he looks cute.”

“Let me surprise Draco,” Trillian chuckled, as she turned on her spaceship’s

invisibility mode and entered the Earth’s atmosphere.

Draco, the dragon was minding his own business. Since the volcano in which he lived had erupted, he was searching for another dwelling before he is spotted by humans. He did not mind animals, but was afraid that humans would carry out experiments on him.

He suddenly felt an invisible force pulling him up.

“What the...!” exclaimed Draco and began to struggle to free himself. But the more he struggled, the more complicated it got.

In the meanwhile, Trillian had flown the spaceship at more than the speed of light and within seconds, she had reached the Himalayas. Down below, perfectly camouflaged by snow was Snowy, building a few ice sculptures.

“What on earth!” he exclaimed, seeing Draco struggling in the air.

Suddenly, the spaceship became visible. The dragon and the snowman looked in astonishment, which quickly turned to delight.

“Trillian?” they shouted in excitement.

“Hi guys,” said Trillian, landing and jumping off the spaceship.

“Trillian!” the duo exclaimed. “It’s so good to see you.”

“Been a few years, right?” laughed the affable alien.

“Years? It’s been a few millennia!” exclaimed Draco. “Remember the time we encountered that crazy incident when India separated from Gondwanaland<sup>G</sup>? Everything was shaking and cracking open,” he recalled.

India separated from Gondwanaland, moved north and attached itself to Asia. The impact of this force resulted in a flat land rising upwards, forming the Himalayas. This happened 100 million years ago because of the continental drift<sup>G</sup> that took place due to massive earthquakes, changes in weather patterns, tsunamis in the oceans, and other extreme natural disasters.



“Of course I do. That is how Trillian, you and I met. She saved us, remember?” laughed Snowy.

“It’s so good to see you guys,” exclaimed Trillian with a smile. “And the Earth is as beautiful as I remember.”

“I suppose,” said Snowy with a shrug. “I wonder what it is like up there. Every night, I see a million stars shining in the sky and wonder how much there is that we do not know yet.”

“The universe is much larger than what humans think it is. We know that extraterrestrial life exists, but for them, it is still a mystery. Maybe in time, they will have the scientific know-how to send manned missions to Mars and beyond,” said Trillian.

“Despite their technological advancement, why haven’t humans been able to travel far?” asked Snowy.

“They haven’t yet advanced enough. Humans are a very young species – just a few thousand years old,” replied Trillian. “Despite that, they have managed to study a number of stars and planets outside their solar system. They have calculated and speculated that some planets could support life. For them, it is definitely a great start.”

“We already know about these planets,” laughed Draco. “You took us, remember?”

“Yes, I do,” she said. “And I showed you a few black holes too. Since I showed you space, how about you show me what is inside the Earth?”

A black hole is similar to a vacuum cleaner. It sucks things into it. Unlike a vacuum cleaner that relies on suction power, black holes use the power of gravity to pull things towards them. Black holes are formed when stars die and become as tiny as atoms. The gravity of a black hole is the same as the gravity of a star with the same mass. If the Sun became a black hole, Earth would continue to orbit the black Sun as usual.

“I would love to come too. But, how will I breath there?” asked Snowy. “I need oxygen!”

“I have a super spaceship, Snowy. It has been designed such that any life form that

boards it gets a universal supply of the gas it needs to live,” said Trillian.

“Oh yes!” said Snowy enthusiastically.

“Where to, first?” asked Draco, “Into a volcano or under water?”

“Volcanoes first!” said Trillian. “I’m not in the mood to enter a really cold environment today.”

“Alright,” said Draco. “Let’s go. I don’t want to travel the same way I came here, though.”

“Hop on board then,” said Trillian, laughing fondly.

The trio boarded the spaceship. Within seconds, they were at Draco’s lair that had just been wrecked. The volcano looked angry and it spewed lava.

The spaceship dived into the volcano. As the trio began to explore the centre of the Earth, they saw ash flying to the top of the crater of the volcano due to high temperatures inside it.

“Draco, how do you survive here?” asked Snowy.

“I’ve lived here for millions

of years. When I need oxygen, I go to the surface. Since there is a dust cloud over the mountain when the lava oozes out, I get time to inhale oxygen without being

A volcano is formed when hot molten rock, ash and gas escape from an opening in the Earth’s surface. Molten rock and ash solidify as they cool, giving the volcano its shape.

seen. I go out at night, when people cannot see me,” Draco replied.

“Smart move,” said Trillian. “Humans have so much to learn, especially respect for other life forms. You have to admit it though: they are pretty tenacious.”

“What do you mean?” snorted Draco bitterly.

“Humans are hard working and determined,” explained Trillian. “They still want to know and do whatever it takes to broaden their knowledge. But science is so vast that even advanced civilizations like ours learn something new every day.”

“What do you mean you learn something new every day?” asked Snowy.

“It means what I said. Knowledge is like the universe, never-ending. Nobody can know it all. I still do not know how big the universe is,” said Trillian.

“I’ve travelled more than all humans, but I still do not know whether it has a beginning or an end and how it all began.”

“Why not find out?” said Draco slyly.

Trillian smiled. She knew where this was headed. Draco and Snowy had barely seen anything in outer space, even if they did know a lot about how the Earth evolved over the centuries.

“Alright,” she said. “Let’s do it!”

With that, the spaceship took a sharp U-turn and zoomed away into space. ■

# MYSTERIES APLENTY 2

*When we look at life, we see that so many mysteries are yet to unravel. Some mysteries are mythical and legendary, while others are scientific. For instance, we can wonder how large the universe is. We know that it is never-ending, but is that an answer that satiates our curiosity?*

*With each passing day, technology advances. In the next 10 years, there may be vaccines and immunity shots against diseases such as cancer and AIDS. We might teleport ourselves, without the need of vehicles or fuel. Isn't that a possibility?*

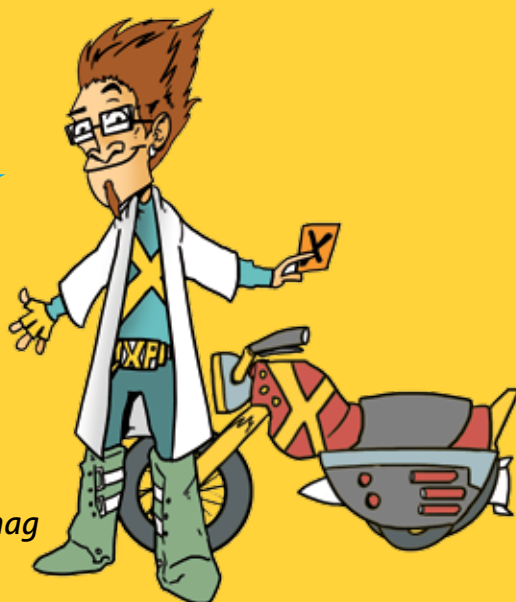
*With these thoughts in mind, we felt that we would not be doing justice by fitting life's biggest mysteries in one issue. For all we know, even two aren't going to be sufficient. But rest assured, we will try our best to address some of the most mysterious topics in the May issue too.*



Image credit: NASA/JPL-Caltech

**Join Mr. X on our fun-do video channel as he performs some amazing experiments and x-plains the science behind them.**

**Wat-a Mirror!, Ghostly Glove, Secret Letter and many more!**



[www.youtube.com/Brainwavemag](http://www.youtube.com/Brainwavemag)



*Underwater World* is the correct answer for the February 2013 issue *Treasure Hunt*. The winner is **Pratul Venkatesh**. He wins a gift voucher worth Rs. 1000! **Abhilash Sadanand, Sathvik Ananthakrishnan, Sathvik Sanjeev, Kashish Hukku-Jani** and **Deven Agarwal** too got the answers right. They deserve a special mention!

Winners of other activities are:

Third Law: **Aditya Vishwakarma**

Ask Us Why: **Nanki Arora**

Toy Box: **Sandeep Pani**

Eye See: **Shubhan Kadam**

Fan Fiction: **Gopal Krishna**

DIY: **Siddharth Divi**

Planet Ninjas: **Mukund Rao**

Magic Science: **Shangar Shanmugan**

Sci-Q Time: **Srinidhi Ayyagari**

To read their responses, visit:

[www.bwmag.in/category/contests](http://www.bwmag.in/category/contests)

**Mukund Rao** and **Shubhan Kadam** get nominated for the BW Student Board. For more details, visit [www.bwmag.in/student-board](http://www.bwmag.in/student-board)

Dear winners (Feb 2013 issue), email your complete name, age, school, address and phone number to [brainwave@ack-media.com](mailto:brainwave@ack-media.com) to receive your gifts immediately! Do not forget to mention the pin-code.

March 2013 winners will be declared in the May 2013 issue.



## Be a Smartenstein!

We run more than ten activities and contests in each issue. They can win you many exciting prizes.

Participate in all the activities of an issue, and you can win a merit certificate, the title 'Smartenstein' and a mystery gift - every month!

There are twelve activities and contests in this issue: 'Toy Box **p4**', 'Ask us Why **p9**', 'Eye See **p21**', 'Third Law **p26**', 'Fan Fiction **p28**', 'Planet Ninjas **p36**', 'Magic Science **p36**', 'Science Fiction **p38**', 'Fun-do Band **p45**', 'Super-teacher Awards **p45**', 'Cool Summer Contests **p46**' and 'Sci-Q Time **p47**'.

[www.bwmag.in/category/bw-smartenstein](http://www.bwmag.in/category/bw-smartenstein)



# A ZAP ACROSS



Image source: emiliokuffer

*While teleportation of humans is still to see the light of day, scientists feel that it is a possibility, given that they have successfully managed to teleport tinier objects!*

by **Sarthak Sinha**

**T**eleporting is intriguing. Imagine being propelled from Point A to Point B in less than a second! Right now it is not possible, but who knows? The future may have a person living in New Delhi, teleporting himself to New York for work and returning home in the evening. Or imagine yourself being teleported to our office to guest-edit an issue of the Brainwave magazine!

For many years, teleporting has only been part of our imagination. But now,

scientists are working towards making it a reality!

What is teleportation? It is the **dematerialisation<sup>G</sup>** of an object at one point and transportation to another point where it is reconstructed, eliminating any concept of time and space.

The first time an experiment on teleportation was successfully conducted was in 1998. Physicists at the California Institute of Technology, USA, along with two European groups,

successfully transported a particle of energy that carries light from one point to another. This photon covered a distance of 3.28 feet!

A photon, of course, is very tiny, probably smaller than an atom and can only be seen under an **electron microscope<sup>G</sup>**! Scientists have so far only managed to teleport tiny particles.

However, teleporting people might to be a reality in future. We could avoid queues to grab a burger at our favourite fast food joint. ■



# A RAINBOW SPRAY

by Kayomarz Bacha

*Learn how you can make a rainbow. Trust us, you require only a hosepipe and sunlight!*

**V**iolet, indigo, blue, green, yellow, orange and red make VIBGYOR, the colours of a rainbow. Rainbows indicate happiness. They also carry a mystery behind them. An Irish legend says that you could find a pot of gold at the end of a rainbow! Now that is fascinating, isn't it? Unfortunately, according to science, a rainbow is only an optical phenomenon and doesn't actually exist. So, you cannot find the end of a rainbow and grab the gold.

Rainbows do not stay for long either. They are seen only when sunlight is reflected from the raindrops. Sunrays comprise of lights of different wavelengths. Short wavelength light appears blue, indigo and violet, while long wavelengths are red, yellow and orange.

When this light is projected onto a drop of water, it gets scattered i.e. it gets refracted and internally gets reflected, within a few seconds, to form a rainbow.

A rainbow can be made on a small-scale as well, with only a hosepipe, on a sunny day. Connect the hosepipe to a tap, turn it on and place your thumb over the pipe's outlet, so that water is sprayed and a mist

is created. Ensure that you are between the Sun and the mist, with the Sun behind you. Voila! You will see a rainbow.

You can modify the way the rainbow appears. You can also play a role in the way the colours of the rainbow form. Observe how the rainbow colours are when you bring the mist of water closer to the sun or take it farther away from it. ■



Note your observations and mail them to [brainwave@ack-media.com](mailto:brainwave@ack-media.com) with 'Eye See' as the subject. The most comprehensive research will give you a chance to be on our Student Board!





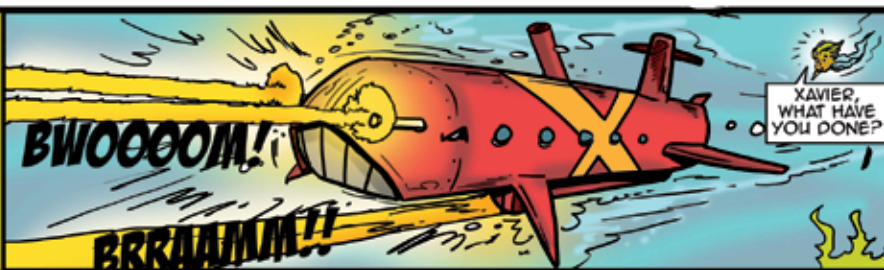
# THE SMARTIES

## THE UNDERWATER RESCUE PART 1

STORY: JAYADEV CALAMUR

ART & LETTERING: ABHIJEET KINI

IN THE LAST EPISODE, X-PERRYMENT ESCAPED, LEAVING THE SMARTIES WITH A MISSILE SHOOTING SUBMARINE.



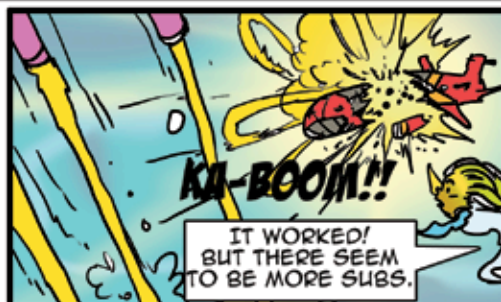
XAVIER, WHAT HAVE YOU DONE?

WHILE I CANNOT DESTROY THE MISSILES, WHAT IF I TAKE A CHANCE AND BOUNCE THEM ONTO THE SUBMARINE!



KI-BOOM!!

IT WORKED! BUT THERE SEEM TO BE MORE SUBS.



GUYS, THIS IS GOING TO BE TOUGH. XAVIER HAS MANAGED TO HIDE MORE THAN ONE SUBMARINE UNDER WATER. I HAVE DESTROYED ONE, BUT THE SECOND ONE IS STILL FIRING MISSILES! IT'S HIDDEN DEEP, REALLY DEEP!

HOW ON EARTH DID HE MANAGE THAT? HE NEEDS MATERIAL THAT CAN WITHSTAND HIGH UNDERWATER PRESSURE AND TEMPERATURE.



I AM THE ONLY ONE WHO CAN STOP THIS MADNESS. I CAN SWIM THAT DEEP INTO THE OCEAN WITHOUT ANY TROUBLE. BUT I NEED SOMEONE TO GUIDE ME. SEE YOU!

DON'T ARGUE! WE DON'T HAVE TIME.



<ARE YOU ALRIGHT?>

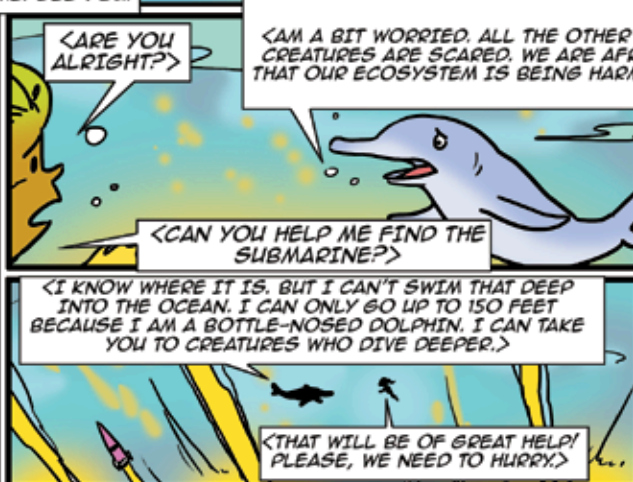
<AM A BIT WORRIED. ALL THE OTHER SEA CREATURES ARE SCARED. WE ARE AFRAID THAT OUR ECOSYSTEM IS BEING HARMED.>

<CAN YOU HELP ME FIND THE SUBMARINE?>

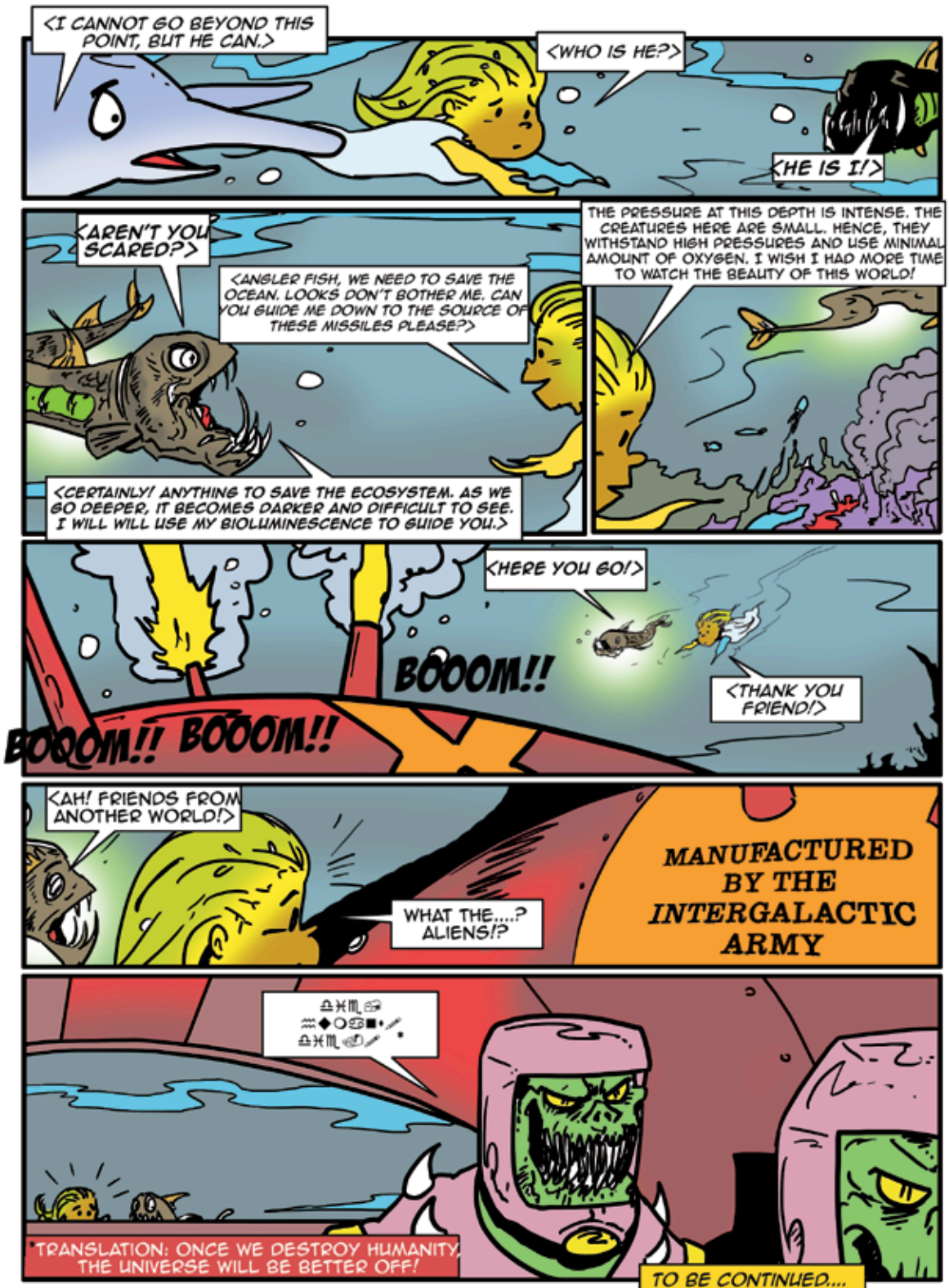
<I KNOW WHERE IT IS. BUT I CAN'T SWIM THAT DEEP INTO THE OCEAN. I CAN ONLY GO UP TO 150 FEET BECAUSE I AM A BOTTLE-NOSED DOLPHIN. I CAN TAKE YOU TO CREATURES WHO DIVE DEEPER.>

WHAT DID THESE CREATURES DO, XAVIER? THIS IS HYPOCRISY! WHY MAKE THEM SUFFER WITH YOUR WEAPONS? OR DID YOU CONVENIENTLY FORGET?

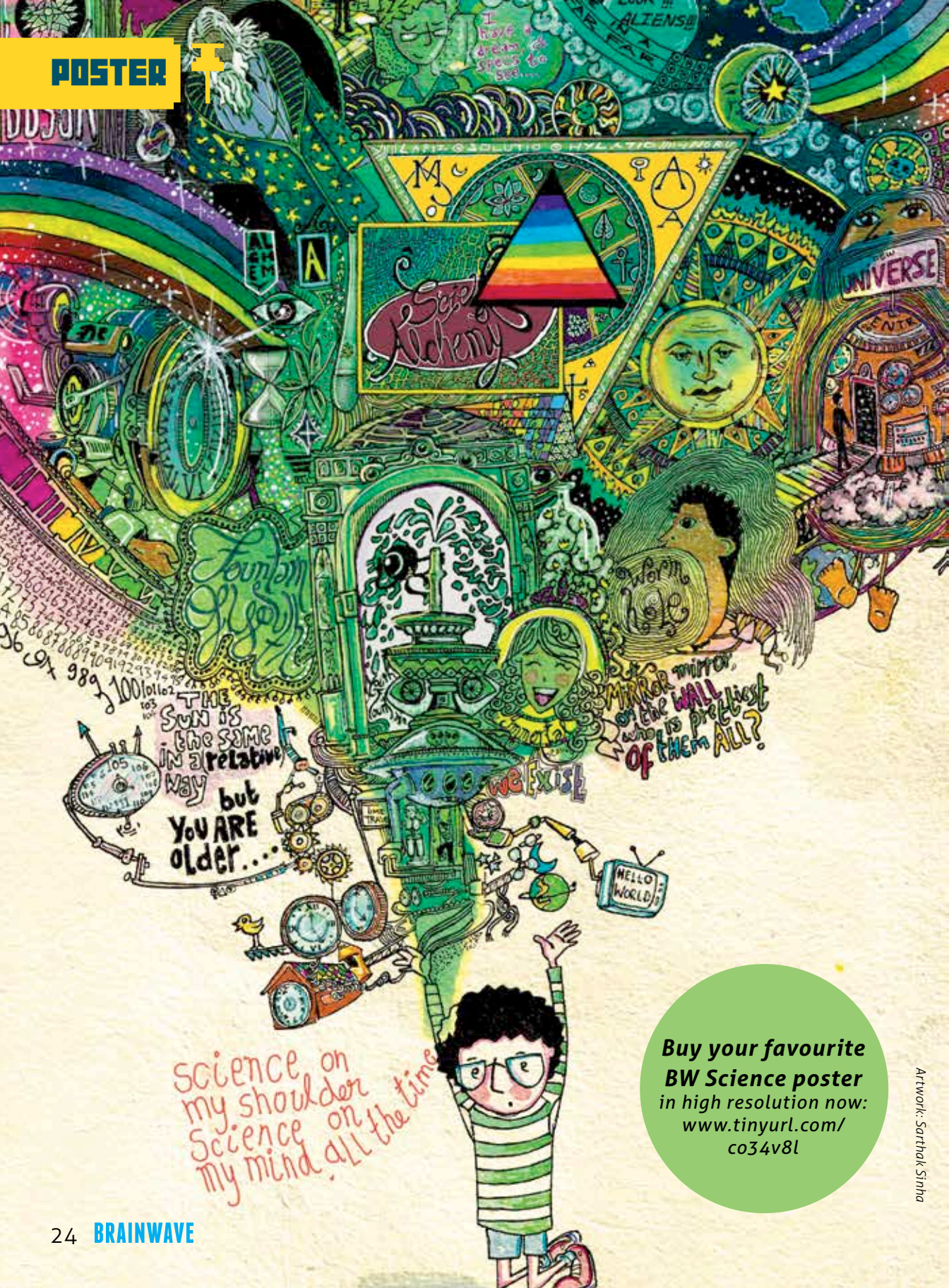
<THAT WILL BE OF GREAT HELP! PLEASE, WE NEED TO HURRY.>











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# Magic or Reality?

*Read minds, make things disappear and even walk on water. After all, all of this is possible today.*

by Skree!



A few days back, I watched a video in which US-based illusionist David Copperfield flew, made the Statue of Liberty disappear, read the mind of someone in the audience, and even hypnotized people to do whatever he told them to. Today, there are several magicians and illusionists such as Chris Angels, David Blaine and Derren Brown, who have amazed us with their 'mind reading' antics.

Hypnosis and mind reading have their own science. Hypnosis involves several relaxation techniques in which a subject is put at ease, is made to breathe slowly and is put in a state of trance as if in deep sleep. At that moment, the mind and body are relaxed and are in complete harmony. The mind is in its most suggestible stage, which is why the subject does what the magician or illusionist suggests.

Optical illusions work in a similar way. When you look at it, all David Copperfield did was place a giant image resembling the surroundings of the Statue of Liberty between the audience and the actual statue. The statue was deleted from this giant image, making the audience believe that the statue had disappeared!

These are relaxing techniques and optical illusions. But what if humans did have the powers to make things disappear or control people, just like Lord Voldemort did? What if with the snap of a finger, we could make things disappear? ■

Artwork: Saudamini Tamboy

Here is a little task: Write in 150 words what you would do if you possessed such magical powers. Email your answers to [brainwave@ack-media.com](mailto:brainwave@ack-media.com) with 'Third Law' as the subject. You could win a chance to be on our Student Board!



## A MYSTERIOUS MANUSCRIPT

by Sasikanth C

**T**he Voynich Manuscript is considered to be the world's most mysterious manuscript. It dates back to the early 15<sup>th</sup> century and there are assumptions that it originated in Northern Italy. The manuscript comprises of illustrations and text about plants and is assumed to be a book that describes the medicinal uses of plants.

However, here is the mystery - most of the

plant illustrations do not match any species known to us. Also, the manuscript's text is unreadable till today. Several professionals have tried studying the manuscript, but nothing has been deciphered. This has made the manuscript a subject of fanciful theories and novels.

Will science ever crack this code?  
Hopefully soon! ■

## A STONEY MYSTERY by Sasikanth C

**T**he Stonehenge has always been a mystery. Questions about how, when, and who built it are still being answered today. There have been several archaeological studies, but there is no concrete evidence about the exact period of when it was built.

Scientists suggest that Stonehenge could have been built anywhere between 3000 BC and 2000 BC. That is a thousand year difference and a lot can happen over such a long period. They also suggest that Stonehenge is a burial ground

and is a place of religious significance.

One question that remains to be answered is how the huge rocks were placed over the others. There were no cranes or any kind of advanced machinery in those days.

Some attribute it to an advanced civilization, while others feel that extraterrestrial groups are responsible. One day, we may find the answers, but until then, Stonehenge will be one of the Earth's most enticing mysteries. ■



*Image source: Wikimedia Commons*

## Earth to the doom, Mars to the rescue!

By Pratul Venkatesh,  
Age 10



**T**hink about leaving the Earth and going to live on Mars, forever. It would be saddening to leave the planet on which we originated. But we will have to leave it in a few million years because the Earth, as it is going around the Sun, is also moving closer to it.

Imagine life on Mars, with the many new situations we would have to adapt to. It will take a long time to rebuild everything from scratch. But, it would also mean that we get another chance to live in harmony with nature. This

time, it should be a whole new start. We must conserve nature and its animals. We should ensure less pollution and development of eco-friendly technology. We should ensure that we would be truly closer to the amazing term 'NATURE'.

On Mars, a whole new world would lie in front of us. Though conditions would be new and harsh, we would adjust to them. Nothing is impossible. If humans believe that it is possible, they will do it, even if it takes a few millennia. ■

Email your science fiction stories to [brainwave@ack-media.com](mailto:brainwave@ack-media.com)  
The best one gets published here and wins a surprise gift!



## Letters from Readers

Experiments like 'Ocean in a Bottle' (DIY - March 2013 issue) should not be suggested because in that experiment, a lot of oil is wasted.  
Pratul Venkatesh, via email.

Dear Pratul,

We agree with the fact that no resource should be wasted. We are glad to see this thought process in our young readers. In the case of the 'Ocean in a Bottle' experiment, you can separate the oil and use it for other experiments.

Kayomarz Bacha.

In the process of renewal of my subscription, I missed the January 2013 issue of Brainwave. As a result, I also lost the cool stuff in it. I wish to know the story of the "Time Travelling Kumars" in that issue. Can you please send a brief to me?  
Vaman Nitin Sinai Neurekar, via email.

Dear Vaman,

We had emailed the whole issue (soft copy) to you. Hope you enjoyed it as much as the others.  
JD, Editor.

Having read the article published in BW September 2012 issue about synesthesia, I realized that I am one among the Synesthetic and I wrote my experience to BW. It was published in Oct 2012. I shared this with my school principal and she gave a small talk about synesthesia in the school assembly. One day, she called me and showed a news article published in 'The Hindu' about the on-going

research on synesthesia in our country. I contacted the research person who is a professor in a college in Andhra Pradesh. She came over all the way to Chennai to meet me. She educated me on how to effectively use synesthesia for my studies as well as in every day life. I have to thank BW for showing me my 'secret sense'. I hope that BW will publish more articles like this. Thank you.  
Revanth Kausikan, via email

Dear Revanth

I am glad that Brainwave has helped you out. I took over in November 2012, but I shall inform Vinayak Varma, the founding editor about how the magazine has helped you.  
JD, Editor.

Dear Brainwave, you are awesome! I take all my issues to school and whenever a teacher discusses something, I know the answers because I have read it in Brainwave. We have cumulative assessment in our school. We get grade points for answering questions in the class. Guess what grade I get - an A+! Love you Brainwave.<3 <3 <3  
Abhilash Sadanand, via email.

Dear Abhilash,

It is great to hear from you. Good to know that you get A+. We encourage you to look beyond the grade. Study for the love of science and grades will automatically follow. Keep asking questions and searching for answers.  
JD, Editor.





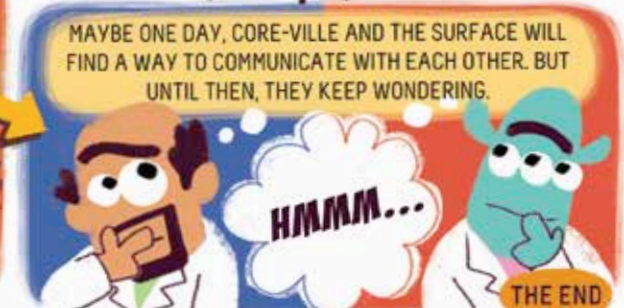
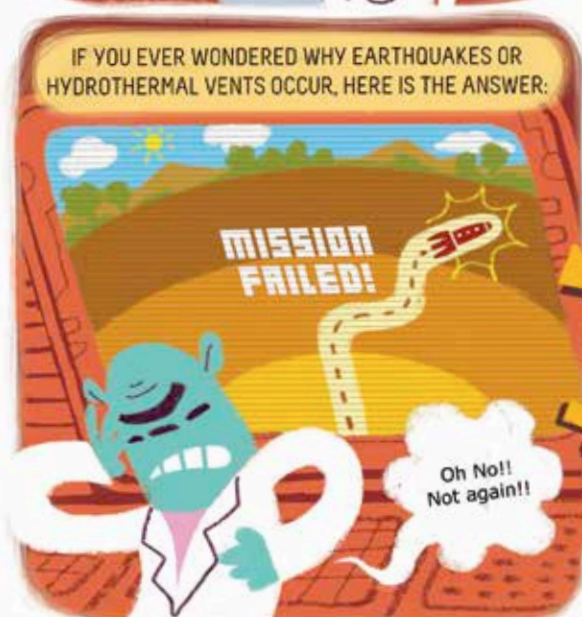
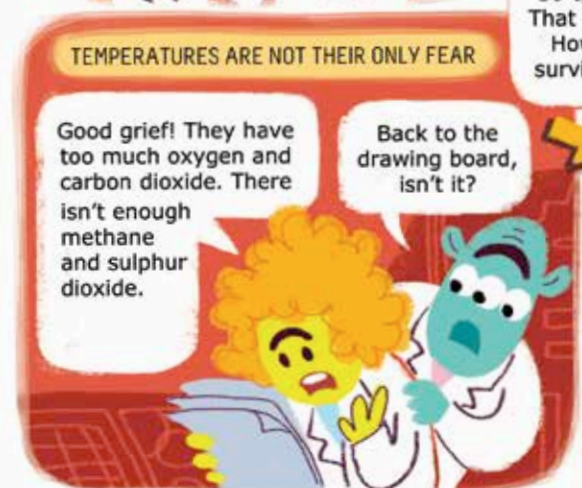
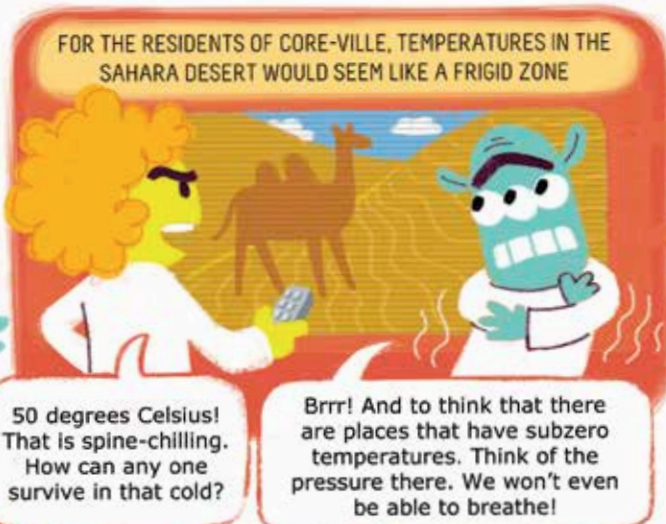
# THE CORE-VILLE FILES

SCRIPT BY JAYADEV CALAMUR  
ARTWORK BY ARCHANA SREENIVASAN

IT'S A NORMAL  
SUMMER IN  
CORE-VILLE, THE  
CITY IN THE  
EARTH'S CORE.









# A Cern-tific Life

## Part 1

*Dr. Jeff Temple, who recently finished his post doctorate research at CERN<sup>G</sup>, where he worked on the Large Hadron Collider<sup>G</sup>, talks about quarks, work as a particle physicist had how you could be a particle physicist yourself.*



by Bhoo

**D**r. Jeff Temple worked as a high school teacher for four years after majoring in physics from MIT. He then did his postgraduate studies in particle physics from the University of Arizona. Later, he completed his Ph.D from Fermilab Tevatron, the world's highest-energy man-made particle collider<sup>G</sup> before the LHC was built.

### EXCERPTS FROM THE INTERVIEW :



What work did you do as a particle physicist?



As a graduate student, my research involved measuring the mass of the top quark. As a postdoctoral researcher, I first looked at the top quark "cross section" (or production rate) at the LHC. Since the energy of the LHC is

much higher than the Tevatron, top quarks should be produced more frequently there.

By comparing the observed rate with theoretical predictions, we can test our current theory of particle interactions. An observed production rate that is smaller than expected would mean that the theory is incorrect. A higher-than-expected rate indicates that there might be some sort of new physics, not described by the Standard Model that is producing extra top quarks. Our measurements so far show that the rates agree with the predictions.

After I worked on the top quark cross-section measurement, I moved to a search for new particles.





neutrons. A proton is made up of two up quarks and a down quark, while a neutron is made from two down quarks and an up quark.

The top quark is tens of thousands times more massive than the up or down quarks. Because it is so huge, it decays very quickly. Thus, it cannot be found in stable particles such as protons or neutrons. We need to accelerate and collide particles at very high speeds in order to produce enough energy to produce top quarks.



**What do you love most about physics?**



**You speak of quarks. What are they?**



Quarks are one example of 'fundamental' particles – ones that are not made up of any smaller parts (at least as far as we can tell). The two lightest quarks -- the 'up' and 'down' quarks -- can bind to form protons and



I love many things about physics. There is an elegant simplicity to physics. Concepts that are considered complicated are not more complicated than they need to be. The fact that we can describe all the observed interactions of matters with a handful of particles, as well as four fundamental forces (electromagnetism, gravity, and the strong and weak nuclear forces) is mind-boggling.

It is physics that makes the universe seem like a more understandable and beautiful place to live in.



**Is there anybody in the field of physics that you look up to - Einstein, Feynman or Carl Sagan?**



I have great admiration for Michael Faraday. He was largely self-taught: by reading books that he encountered as an apprentice bookbinder. He became one of the greatest experimental physicists in history. He discovered electromagnetic induction and benzene, and laid the groundwork for the first electric motor. He also took a strong interest in public education and created the Royal Institution Christmas Lectures, a public science lecture series for young students that runs even today.



**What advice would you give to those kids who wish to take up particle physics?**



First, a good background in mathematics is necessary for any physicist. If you wish to be an experimental physicist, you will also need to have decent computer programming skills. At the CMS experiment, there are nearly 40 million beam collisions every second. You can only imagine the amount of data we have to process!

Experimental particle physicists also need to be good at working with other people. Today's big particle physics experiments are too big for any one person to understand. With a few thousand collaborators working with you on an experiment, you need to be able to communicate comfortably in order to get anything done.

*To be continued...*

Read the second part of the interview in which Dr. Jeff Temple talks about his love for physics, the Big Bang Theory and the television show with the same name, in the May 2013 issue. ■



**What is particle physics?**



Particle physics is the study of the interactions of the smallest objects i.e., particles in nature. It is a field that is important because, in the moments immediately after the Big Bang, the universe



# A GHOSTLY AFFAIR

*Are there supernatural beings? Do ghosts and other spirits exist? Is there a science behind an out-of-body experience? Although there is no scientific proof, related theories and experiences have not been rubbished.*

by **Kashmira Sarode**

**A**re ghosts real? It is a fair question. People have spoken of out-of-body experiences, being possessed, seeing or feeling things and many other incidents that are too scary to mention here.

In order to explain, scientists opine that paranormal activity is not a part of science. If it were, they argue, then it would not be paranormal. People continue to claim to have encountered ghosts and talk about recalling their past lives, while others speak of out-of-body experiences.

These experiences are not



Source: *londonghost*

however entirely treated as hogwash or as rural legends. There will still be someone warning you about the haunted house, or someone else discussing one's past life with you. Such thoughts are scary. I can vouch for this. Once, someone I know claimed to have had a vision of his past life

in a house that he had never visited earlier. He spoke of each room and scared the owner of the house!

Hopefully, there will be an explanation about these in the future. Until then, we can do nothing but let such incidents freak us out! ■





Source: Wikimedia Commons

## AGE NO BAR FOR TREES

*How old can trees grow to be? How do they survive for so long?*

by Sasikanth C

How do trees live for so long? A primary reason is their compartmentalized vascular system. This system is designed in such a way that if one portion of a tree dies, the other portions can still survive. And unlike mammals, trees continue growing even when they are a hundred years old!

the number of branch whorls. Whorls are circular or spiral structures on the tree trunk from which branches shoot out. The total number of such whorls plus one (to account for the tip of the tree) gives you the approximate age.

Another way to do it is to count the number of gaps between the branch sections of the tree, including of that above the last branch.

This number will give you the approximate age of the tree. ■

There are several methods to determine a tree's age. Some of them harm the tree. So, we will not discuss them here.

A simple way is by counting

**A**t least 50 trees on Earth are over 1000 years old! What is even more surprising is that there seem to be countless such trees that haven't been discovered yet.

Research and tell us how cutting down trees harms us. The most comprehensive and original answer wins the latest ACK Comic! Write to [brainwave@ack-media.com](mailto:brainwave@ack-media.com) with 'Planet Ninjas' as the subject.

## A Secret Letter

by Kayomarz Bacha



**J**ohn wanted to tell his friend Jack a secret, but could not because their classmates were always around. So, John wrote a secret letter that only Jack could read.

Writing a secret letter is easy. All you need is some lime juice, blank paper, ear buds and a candle.

Dip the ear bud in the lime juice and write your secret message on the paper. Let it dry for 5 – 10 minutes.

Light a candle and hold the paper above the candle flame. Very carefully, start heating the area of the paper where the message is. Ensure that the page doesn't get burnt and your message will appear! ■

Research and email more such science tricks to [kayomarz.bacha@ack-media.com](mailto:kayomarz.bacha@ack-media.com)  
The selected one gets published here and wins an Amar Chitra Katha animation CD!



# Carbon Copies Needed?

by Dr. Dodo

**D**olly the sheep was the first successfully cloned animal in 1997. Since her creation, scientists have succeeded in cloning several animals. These include dogs and mice. Scientists are also in the process of cloning mammoths. They may even recreate a Jurassic era, where they clone a dinosaur. Thankfully, as of now that is still a speculation.

However, scientists are still persistent with their attempts at cloning a human. There have been several attempts, but none has been successful. This is because genetic modification at that level is extremely complex and risky, which could even lead to **mutations**<sup>G</sup>.

Scientists plan to clone a human in the same way that they cloned Dolly, the Sheep. The method is called Somatic Cell Nuclear Transfer. In this method, scientists take the egg from a female donor and remove the nucleus. A cell, which contains the DNA, is taken from the person who is being cloned. Then the cell is fused with the egg, thereby creating an embryo. This embryo is implanted into a surrogate mother through **in-vitro**<sup>G</sup> **fertilization**.

The success rate of cloning regular animals is only 1- 4%. In fact, Dolly, the Sheep was cloned after 277 failed attempts! The human system is more complex than other animal systems due to the advanced brain that humans possess, so the chance of an embryo surviving further reduces.

*The success of human cloning could end diseases such as cancer and AIDS, but could result in mutations that could cause diseases that we haven't even heard of.*

When it comes to cloning, technology is still under-developed, for the level of complexity involved. While Dolly may have been a successful clone, she died young, of a progressive lung disease and severe arthritis. These diseases are normally not seen in sheep. So in a way, it was mutation.

While scientists may be able to successfully clone the first human that could be immune to diseases such as cancer and HIV, the chances that the clone may carry other new diseases not known to science is a strong possibility. Until these factors are sorted out, human cloning remains only an aspiration for the future. ■



Human Clone - Wikimedia Commons  
(for representational purposes only)



In episode 4,  
the Kumars had  
just  
landed in  
Atlantis, in  
their time  
machine.



Atlantis Existed!

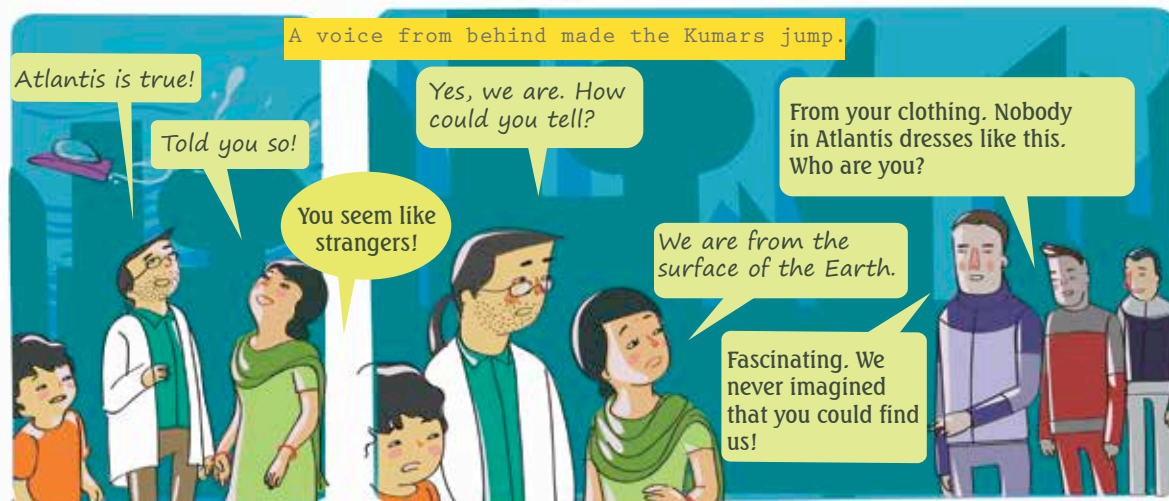


As the Kumars look up...

Oh my god, This  
is amazing!



The Kumars admire  
the Utopian world  
for several minutes.



A voice from behind made the Kumars jump.

Atlantis is true!

Told you so!

You seem like  
strangers!

Yes, we are. How  
could you tell?

From your clothing. Nobody  
in Atlantis dresses like this.  
Who are you?

We are from the  
surface of the Earth.

Fascinating. We  
never imagined  
that you could find  
us!



We regularly study the Earth's movements. But there is no data to show that you could come here. How did you manage it?

My dad built a time machine. It brought us here.



We must take you to the Council of the Wise. They must know. It is a huge day for Atlantis!

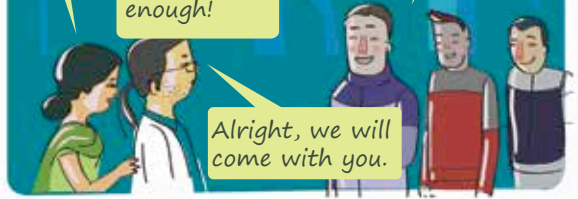
Council of the Wise?

Kumar, I'm not certain of this.

Why, of course! The Council of the Wise ensures that we live in peace and harmony. You should come with us. They would be delighted.

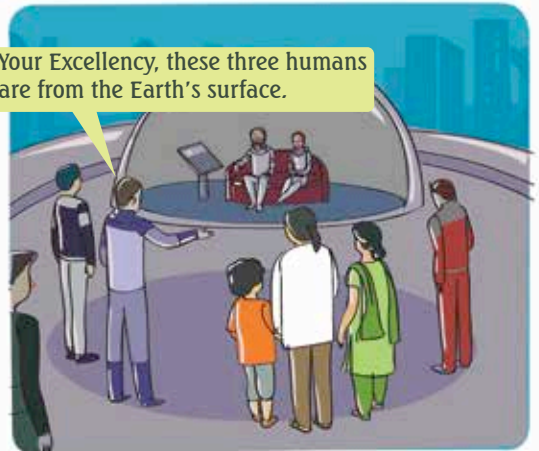
Geeta, they seem friendly enough!

Alright, we will come with you.



The chamber of the Council of the Wise.

Your Excellency, these three humans are from the Earth's surface.



How did they find Atlantis?

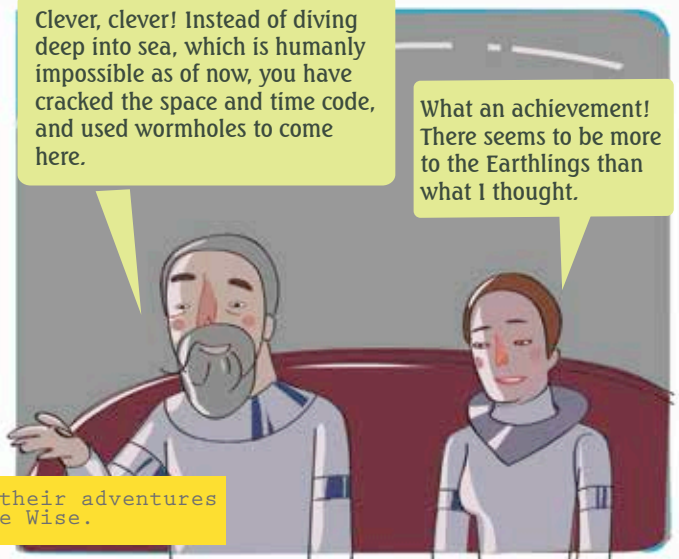
They came here in a Time Machine.

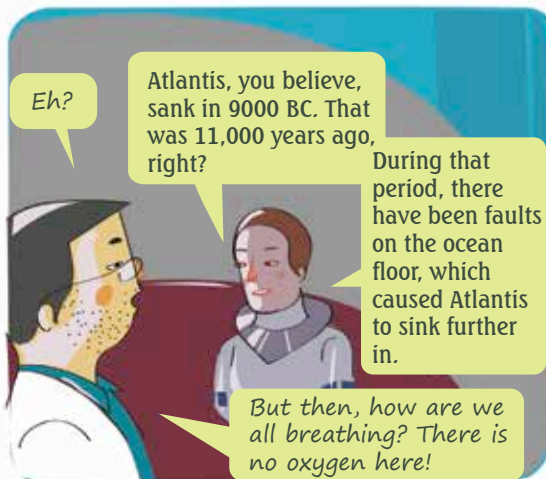
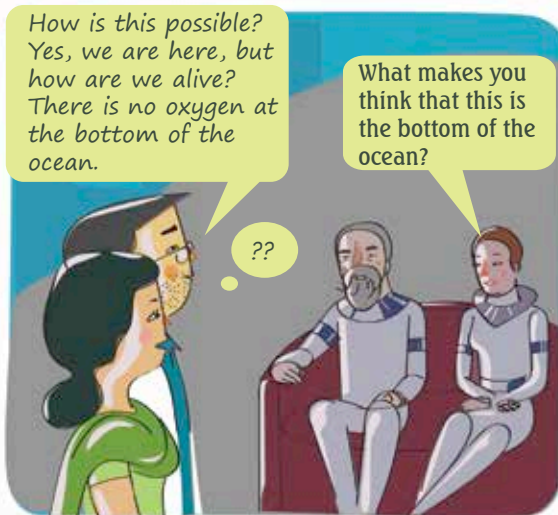


The Kumars narrated their adventures to the Council of the Wise.

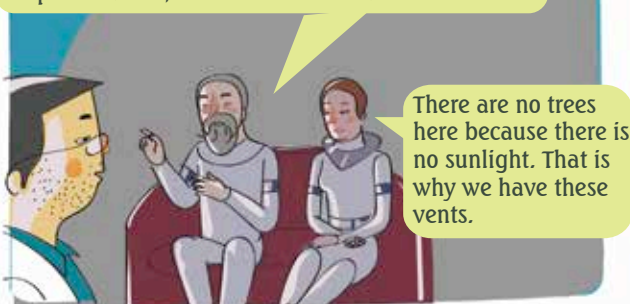
Clever, clever! Instead of diving deep into sea, which is humanly impossible as of now, you have cracked the space and time code, and used wormholes to come here.

What an achievement! There seems to be more to the Earthlings than what I thought.



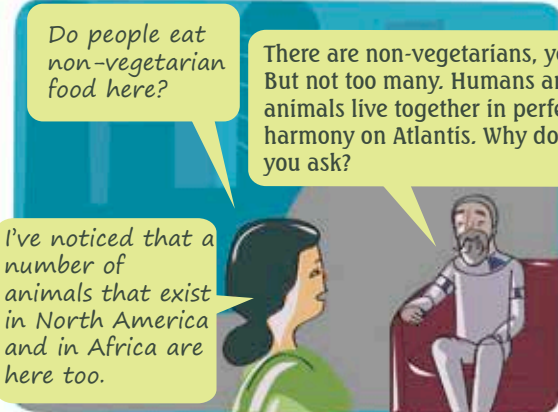


Here, the ocean is the sky. If there wasn't a shield above us, the water would come down with great force and submerge us into oblivion. There is an indestructible force field above us. It has vents that absorb oxygen from water and supply it to us. The carbon dioxide we exhale is sent out through separate vents, into the water above.



But we became arrogant. We wanted to dominate the world. We attacked the Greeks, who sought the help of the Gods. The Gods favoured them and sunk us.

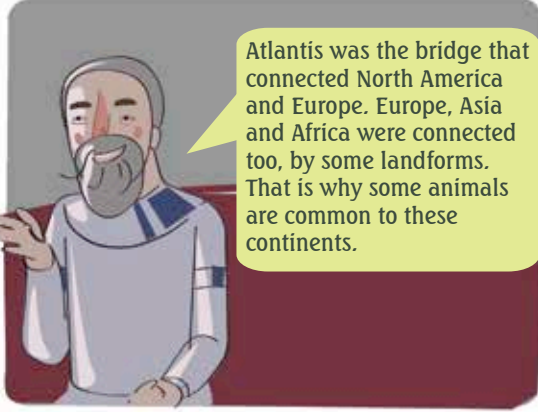




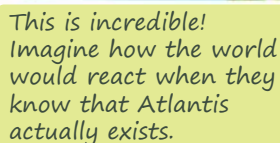
Do people eat non-vegetarian food here?

There are non-vegetarians, yes. But not too many. Humans and animals live together in perfect harmony on Atlantis. Why do you ask?

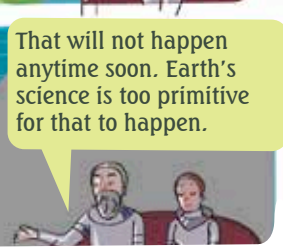
I've noticed that a number of animals that exist in North America and in Africa are here too.



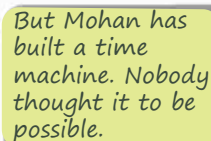
Atlantis was the bridge that connected North America and Europe. Europe, Asia and Africa were connected too, by some landforms. That is why some animals are common to these continents.



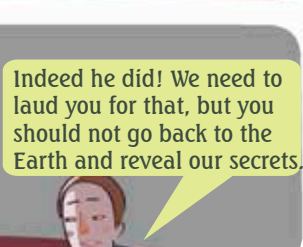
This is incredible! Imagine how the world would react when they know that Atlantis actually exists.



That will not happen anytime soon. Earth's science is too primitive for that to happen.



But Mohan has built a time machine. Nobody thought it to be possible.

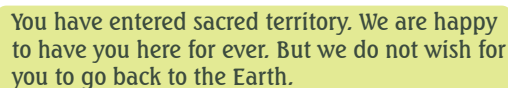


Indeed he did! We need to laud you for that, but you should not go back to the Earth and reveal our secrets.

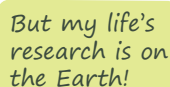


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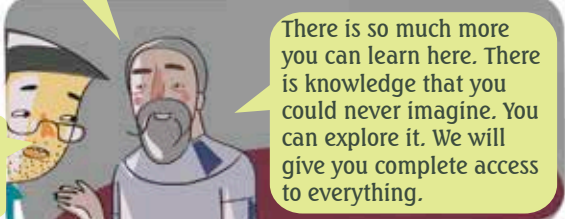
What do you mean?!




You have entered sacred territory. We are happy to have you here for ever. But we do not wish for you to go back to the Earth.



But my life's research is on the Earth!




There is so much more you can learn here. There is knowledge that you could never imagine. You can explore it. We will give you complete access to everything.



The offer is tempting, isn't it?

Are you mad? What about my life? And Dinesh's school?



Mom! Dad! Let us stay here. It is exciting.

Uh-ho! What do we do now?

Should the Kumars stay back in Atlantis and gain knowledge that they never knew was possible OR should they return to the Earth?

What do you think? Email us at [brainwave@ack-media.com](mailto:brainwave@ack-media.com) with 'Scence Fiction' as the subject.

If your thoughts match the original script, you can be the co-author of the next two episodes!





# GEEKY STARS

*From holding a post graduate degree in criminal psychology to being a certified Ph.D in neuroscience, these celebrities certainly know how to bring on the science degrees!* By Sarthak Sinha



## A Real Geek in The Big Bang Theory

Mayim Bialik, who plays the character of Amy Farrah Fowler in *The Big Bang Theory*, is a certified Ph.D in neuroscience.

She achieved her degree from UCLA, although she was also accepted into Harvard and Yale for their programmes! In fact, her character Amy in *The Big Bang Theory* also plays a neurobiologist.

In addition to holding a Ph.D in neuroscience, Bialik also holds degrees in Hebrew and Jewish Studies. Now that is being diverse!

## Preity's Pretty Psychologic!

Bollywood actress Preity Zinta is quite the brain. Not only is she famous for her movies and for owning an IPL cricket team, but also for holding quite a few degrees! Apart from an MBA, she also holds a postgraduate degree in criminal psychology!

What does that mean? Criminal Psychology involves studying the personalities of criminals, observing and understanding why they do the things that they do, and even interviewing them to get those answers.

It sounds dangerous, doesn't it? It cannot be denied that Preity is also brave.

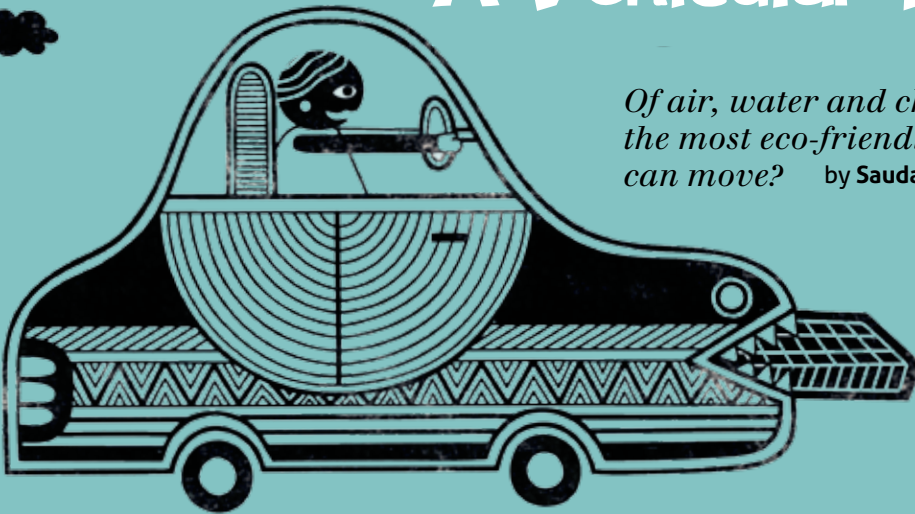
## Maddy's the Electric Man

R Madhavan, who has had equal success in the Tamil film industry and Bollywood, is in fact a trained electronics engineer. He acquired this degree from Rajaram College, Kolhapur.

This is a complete contrast to his role in the Bollywood hit *3 Idiots*, where Madhavan plays a student, who cannot understand the basics of engineering. We guess that if one is an actor, anything is possible, isn't it? ■

# A Vehicular Moment

*Of air, water and chocolate, what is the most eco-friendly way our vehicles can move?* by Saudamini Tambay



**T**oday's vehicles run on petrol, diesel, compressed natural gas, electricity and even solar power. Some vehicles are hybrids, which means that they can run on petrol as well as on eco-friendly sources such as electricity or compressed natural gas.

As we advance to improved modes of travel, we might also consider other options such as vehicles running on compressed air, water or even chocolate!

The air vehicle exists, but still has to gain popularity and so do several other technological advancements. While the compressed air vehicle is energy-efficient, there are a number of performance issues.

The main issue is that it can run only short distances. Early tests have shown that vehicles running only on compressed air can travel a maximum of 7.2 km at a stretch.

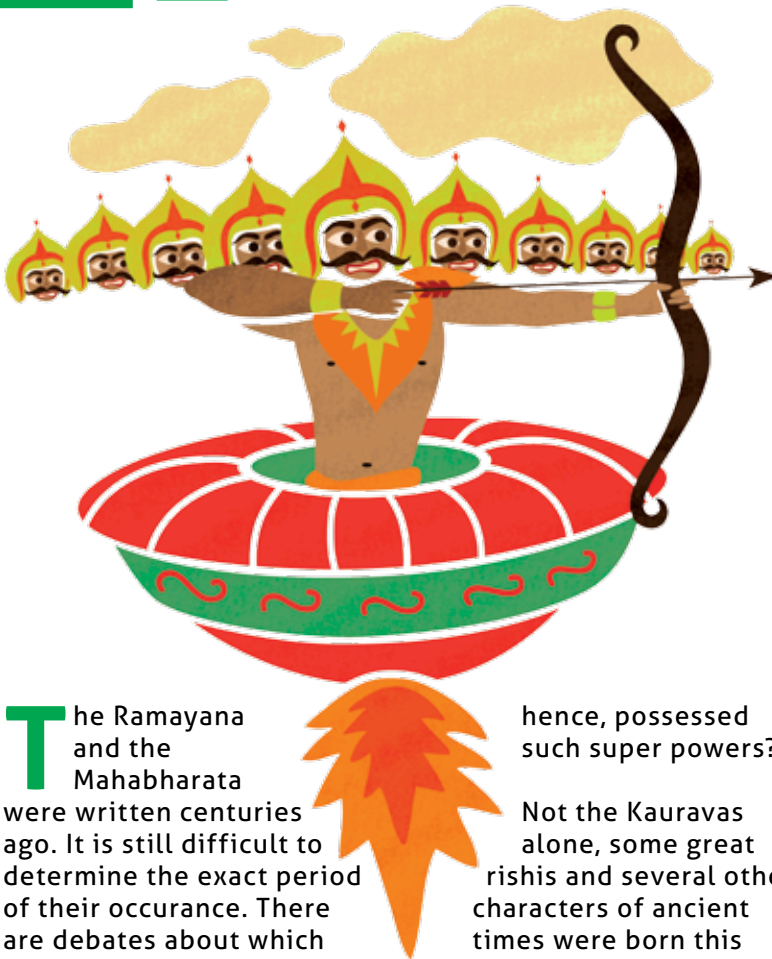
There also are attempts at constructing the first water vehicle. While there have been patents claiming that it has been invented, the first vehicle to run on water is yet to be brought onto roads. However, there is one

dilemma: according to the laws of science, there is no way to extract chemical energy from water alone. This is because energy is required to break the water molecule into hydrogen and oxygen. Many proposed vehicles work on the principle of electrolysis that breaks water into hydrogen and oxygen, and then recombines them to release energy.

However, this method is flawed because the amount of energy required to break off oxygen and hydrogen will be greater than the energy released when they are combined.

There is apparently another form of fuel, which has turned out to be quite successful. It is chocolate! In 2009, a racing car was designed by researchers at the University of Warwick, in England. It runs on bio-fuel made from waste chocolate and plant oils. The car has a top speed of 135 mph and can reach a speed of 60 mph in 2.5 seconds, which is really fast.

No wonder this option is as delicious as chocolate! ■



# AN EPIC THEORY

*The great Indian epics, The Ramayana and The Mahabharata have had some brilliant science behind them, indicates research.*

by Arby

**T**he Ramayana and the Mahabharata were written centuries ago. It is still difficult to determine the exact period of their occurrence. There are debates about which was written first, but that is another mystery for another time.

However, there are a number of science-related questions that arise from these epics. Was Ravan's chariot, the Pushpaka Vimana, a UFO? Did Arjuna and Karna use nuclear arrows in the battle of Kurukshetra? Were the devas and asuras aliens from another planet? Were the 100 Kauravas born through the process of human cloning? Was Hanuman a mutant and

hence, possessed such super powers?

Not the Kauravas alone, some great rishis and several other characters of ancient times were born this way. Rishis Agastya and Vasishtha are said to be born out of pots.

There are a number of theories that describe how medically advanced ancient India was. According to the Rig Veda, the oldest of the four vedas – the others being Yajur Veda, Sama Veda and Atharva Veda – the Ashvin gods restored sight to the blind, regenerated limbs lost in battle, and even helped cripples walk again.

Not only the medical advancements, but also the

modes of transport that existed during those times are intriguing. Maharshi Narada had access to all the lokas and could just 'appear' anywhere. Was he teleporting himself?

Now, devaloka is nowhere on Earth. It is another city beyond the clouds. Does this mean that it was an alien city? Were the devas and the asuras aliens with great scientific knowledge?

Now, here is the biggest mystery: if these events existed and several archaeologists have published research papers to prove that they have, how did such advanced civilizations suddenly disappear, leaving us in the 21st century wondering whether alien civilizations do exist? ■





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**p15**

**Gondwanaland and Continental Drift:** For many millions of years, all the land of the Earth was joined together as one large body.

About 200 million years ago, the land began to drift apart. It broke into two pieces - Laurasia (in the north) and Gondwanaland (in the south). Gondwanaland included Antarctica, South America, Africa, India and Australia.

The two large pieces continued to break apart into the smaller continents that exist today. This movement is called 'continental drift'

**p20**

**Dematerialization:** Dematerialization is the breaking down of an object into its smallest possible atomic configuration. Teleportation involves the dematerialization of an object at one point and sending its precise atomic configuration to another location, where the object will be reconstructed. This means that time and space are irrelevant to travel - objects can be transported to any location instantly.

**Electron Microscope:** An electron microscope uses an electron beam to illuminate a specimen and produce a magnified image. It has greater resolving power than a light microscope and can reveal the structure of smaller objects.

**p32**

**CERN:** CERN is The European Organization for Nuclear Research. It operates the world's largest particle physics laboratory.

**Large Hadron Collider:** LHC is the world's largest and most powerful particle accelerator. It consists of a 27-kilometre ring of superconducting magnets with a number of accelerating structures to boost the energy of the particles along the way.

**Particle Collider:** When the universe was

younger, it was smaller and all of its energy was concentrated in a small amount of space. The average energy of the particles in it was very large. Particle colliders simulate this to enable the study of the universe better.

**p37**

**Mutations:** A mutation is a permanent change in the DNA sequence of a gene of an organism.

**In-vitro Fertilization:** In-vitro fertilization is a process by which an egg is fertilised by sperm outside the body, in a laboratory.

## Sci-Q Time!

Finished reading the magazine?  
Answer these simple questions to  
win a mystery gift worth Rs. 500:

1. What are non-newtonian fluids?
2. For at least how many years now have Neanderthals been extinct?
3. What are black holes?
4. What are quarks?
5. What is electrolysis?

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**Toh POP-in karo POPPINS  
aur Bolo, "Doon Kya?"**

everest PB 9/10-12

## WHAT IS BRAINWAVE?

Brainwave is a children's science magazine from the house of Amar Chitra Katha and Tinkle.

We understand that each child has a different aptitude and love for science. Hence, we simplify science into forms that excite them - comics, stories, fun-do activities, contests and fascinating facts.

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April 2013